We claim:

1. An arrangement for cooling an electronic assembly, the arrangement comprising:

a circuit board having a first surface, a second surface, and at least a first heat-generating element secured to the first surface, the circuit board further comprising at least one aperture extending between the first surface and the second surface;

an enclosure member secured to said circuit board so as to form a fluid tight barrier of a compartment defined at least in part by said enclosure member, said compartment including a first subcompartment defined at least in part by said first surface and said enclosure member and a second subcompartment defined at least in part by said second surface and said enclosure member; and

at least one electromechanical actuator secured within the fluid type barrier, the electromechanical actuator operable to generate a flow movement in the direction of the at least one aperture when liquid is disposed in the fluid tight barrier.

2. The apparatus of claim 1 further comprising a liquid disposed within the compartment.

3. The apparatus of claim 1 wherein the circuit board includes a top end portion and a bottom end portion, and wherein the top end portion includes at least on aperture extending between the first surface and the second surface.

4. The apparatus of claim 1 wherein the at least one mechanical actuator includes a piezoelectric actuator.

5. The apparatus of claim 4 wherein the at least one mechanical actuator further includes a substantially rigid blade coupled to the piezoelectric actuator and extending in a first direction from the piezoelectric actuator.

6. The apparatus of claim 5 wherein the piezoelectric actuator is secured within the first subcompartment proximate the at least one aperture and the substantially rigid blade extends from the piezoelectric actuator in the direction of the at least one aperture, and wherein the apparatus further comprises a flapper valve having a first end secured within the second subcompartment proximate the at least one aperture and a second end movably coupled to the first end, the second end movable to alternately allow fluid flow throught the first aperture and inhibit fluid flow through the first aperture.

7. The apparatus of claim 4 wherein the at least one mechanical actuator further includes a flexible blade coupled to the piezoelectric actuator and extending in a first direction from the piezoelectric actuator.

8. The apparatus of claim 7 wherein the flexible blade extends in the first direction from the piezoelectric actuator, said first direction having an axial component with respect to the at least one aperture.

9. The apparatus of claim 7 wherein:

the circuit board includes a top end portion and a bottom end portion;

the top end portion includes at least one aperture extending between the first surface and the second surface; and the piezoelectric actuator is secured within the first subcompartment below the at least one aperture and the flexible blade extends in the first direction toward the top end portion.

10. The apparatus of claim 1 wherein the enclosure includes a plurality of cooling fins configured to convey heat from a fluid disposed within the compartment to an external environment.

11. A method for cooling at least one circuit element disposed on a first surface of a circuit board, at least a portion of the circuit board displosed within an enclosure member that forms a fluid tight barrier that defines, at least in part, a compartment, the compartment including a first subcompartment defined by the enclosure member and the first surface, and a second subcompartment defined by the enclosure member and a second surface of the circuit board, the method comprising:

a) dissipating a quantity of heat generated by the at least one circuit element to a first portion of liquid disposed in the first subcompartment; and

b) employing an electromechanical actuator disposed within the enclosure member to assist in advancing the first portion of liquid through an aperture that extends between the first surface and the second surface to allow the first portion of liquid to pass from the first subcompartment and the second subcompartment.

12. The method of claim 11 further comprising the step of:

c) advancing a second portion of liquid through a second aperture that extends between the first surface and the second surface to allow the second portion of liquid to pass from the second subcompartment and the first subcompartment.

13. The method of claim 11 wherein:

step a) further comprises dissipating heat from the first portion of liquid via convection; and

step b) further comprises employing the electromechanical actuator to assist in advancing at least some the first portion of the liquid through an aperture that extends from the first surface to the second surface such that at least some of the first portion of liquid passes from the second subcompartment to the first subcompartment.

14. The method of claim 11 wherein step b) further comprises employing the electromechanical actuator disposed within the enclosure member to assist in advancing the first portion of liquid through an aperture, wherein the electromechanical actuator includes a piezoelectric actuator.

15. The method of claim 11 wherein step b) further comprises employing the electromechanical actuator disposed within the enclosure member to assist in advancing the first portion of liquid through an aperture, wherein the electromechanical actuator includes a piezoelectric actuator and a blade having a first end coupled to the piezoelectric actuator and a second end extending in a first direction from the first end.

16. The method of claim 11 wherein step b) further comprises employing the electromechanical actuator disposed within the enclosure member to assist in advancing the first portion of liquid through an aperture, wherein the electromechanical actuator includes a piezoelectric actuator and a substantially rigid blade having a first end coupled to the piezoelectric actuator and a second end extending in a first direction from the first end.

17. The method of claim 11 wherein step b) further comprises employing the electromechanical actuator disposed within the enclosure member to assist in advancing the first portion of liquid through an aperture, wherein the electromechanical actuator includes a piezoelectric actuator and a flexible blade having a first end coupled to the piezoelectric actuator and a second end extending in a first direction from the first end.

18. An arrangement for cooling an electronic assembly, the arrangement comprising:

a circuit board having a first surface, a second surface, and at least a first heat-generating element secured to the first surface, the circuit board further comprising at least one aperture extending between the first surface and the second surface;

an enclosure member secured to said circuit board so as to form a fluid tight barrier of a compartment defined at least in part by said enclosure member and said circuit board, said compartment including a first subcompartment defined at least in part by said first surface and said enclosure member and a second subcompartment defined at least in part by said second surface and said enclosure member;

a liquid disposed within said compartment; and

at least one electromechanical actuator secured within the fluid type barrier, the electromechanical actuator operable to generate a flow movement of the liquid in the direction of the at least one aperture.

19. The arrangement of claim 18 wherein the circuit board includes an external portion that extends outward of the compartment.

20. The apparatus of claim 18 wherein the circuit board includes a top end portion and a bottom end portion, and wherein the top end portion includes at least on aperture extending between the first surface and the second surface and the bottom end portion.

21. The apparatus of claim 18 wherein the at least one mechanical actuator includes a piezoelectric actuator.

22. The apparatus of claim 18 wherein the at least one mechanical actuator further includes a substantially rigid blade coupled to the piezoelectric actuator and extending in a first direction from the piezoelectric actuator.

23. The apparatus of claim 22 wherein the piezoelectric actuator is secured within the first subcompartment proximate the at least one aperture and the substantially rigid blade extends from the piezoelectric actuator in the direction of the at least one aperture, and wherein the apparatus further comprises a flapper valve having a first end secured within the second subcompartment proximate the at least one aperture and a second end movably coupled to the first end, the second end movable to alternately allow fluid flow throught the first aperture and inhibit fluid flow through the first aperture.

24. The apparatus of claim 21 wherein the at least one mechanical actuator further includes a flexible blade coupled to the piezoelectric actuator and extending in a first direction from the piezoelectric actuator.

25. The apparatus of claim 24 wherein the flexible blade extends in the first direction from the piezoelectric actuator, said first direction having an axial component with respect to the at least one aperture.

26. The apparatus of claim 24 wherein:

the circuit board includes a top end portion and a bottom end portion;

the top end portion includes at least one aperture extending between the first surface and the second surface; and the piezoelectric actuator is secured within the first subcompartment below the at least one aperture and the flexible blade extends in the first direction toward the top end portion.

27. The apparatus of claim 18 wherein the enclosure includes a plurality of cooling fins configured to convey heat from a fluid disposed within the compartment to an external environment.